WHAT IS CLAIMED IS:

1. A lens function-including optical fiber comprising:

at least one information transmission optical fiber; and

at least one gradient index optical fiber having an outer diameter equal to that of said information transmission optical fiber and having a length exhibiting a specific lens function, said gradient index optical fiber being jointed or contacted with an end surface of said information transmission optical fiber.

2. A lens function-including optical fiber according to claim 1, wherein said information transmission optical fiber is a single mode optical fiber.

3. A lens function-including optical fiber according to claim 1, wherein said gradient index optical fiber is produced by an ion exchange method.

4. A lens function-including optical fiber according to claim 1, wherein, when a refractive-index distribution of said gradient index optical fiber in a wavelength range used is given by the expression:

$$n(r)^2 = n_0^2 \cdot \{1 - (g \cdot r)^2 + h_4 (g \cdot r)^4 + h_6 (g \cdot r)^6 + h_8 (g \cdot r)^8 + \cdots\},$$

said gradient index optical fiber satisfies a condition:

$$0.1 \leq n_0 \cdot g \cdot r_0 \leq 0.5$$

in which r is a distance from an optical axis, $n(r)$ is a refractive index in a position at the distance r from the optical axis, n_0 is a refractive index on the optical axis, r_0 is a radius of

said gradient index optical fiber, g is a refractive-index distribution coefficient, and h_4, h_6, $h_8 \cdots$ are high-order refractive-index distribution coefficients respectively.

5. A lens function-including optical fiber according to claim 4, wherein said gradient index optical fiber satisfies a condition:

$$0.12 \leq n_0 \cdot g \cdot r_0 \leq 0.25.$$

6. A lens function-including optical fiber according to claim 4 or 5, wherein the refractive index n_0 on the optical axis of said gradient index optical fiber is in a range of from 1.40 to 1.80 (both inclusively).

7. A lens function-including optical fiber according to claim 4 or 5, wherein the refractive index n_0 on the optical axis of said gradient index optical fiber is in a range of from 1.50 to 1.70 (both inclusively).

8. A lens function-including optical fiber according to claim 1, wherein a length of said gradient index optical fiber is in a range of from 0.05P to 1P (both inclusively) in which P is a periodic length of said gradient index optical fiber.

9. A lens function-including optical fiber according to claim 1, wherein the length of said gradient index optical fiber is in a range of from 0.05P to 0.5P (both inclusively) in which P is the periodic length of said gradient index optical fiber.

10. A lens function-including optical fiber according to claim 1, wherein said information transmission optical fiber

and said gradient index optical fiber are joined and fixed to each other in a condition that said two optical fibers are inserted in a sleeve having an inner diameter substantially equal to said outer diameter of said two optical fibers.

11. A lens function-including optical fiber according to claim 1, wherein said information transmission optical fiber and said gradient index optical fiber are joined and fixed to each other in a groove which is formed in a planar substrate and which is V-shaped in section.

12. A method of producing a lens function-including optical fiber, comprising the steps of:

immersing a homogeneous glass rod in molten salt to perform ion exchange to thereby form a refractive-index distribution in said glass rod;

forming a gradient index optical fiber with a desired outer diameter by stretching said glass rod while heating said glass rod retained vertically; and

cutting said gradient index optical fiber into a length corresponding to a specific periodic length of said gradient index optical fiber.